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work would add beyond measure to its speed and accuracy. It must be borne in mind that the great delay in publishing the printed record will be in having proof promptly read, and we must spare no trouble to secure prompt proof-reading. This is especially true of the daily bulletin and the minutes of the daily meetings of the various sections and subsections.

Further, there are among the members of the American Chemical Society many who have attended numerous national and international congresses and meetings. Let each such communicate to the officers of the eighth congress what he regards as improvements upon other meetings, and how they might be realized in the eighth congress, or what departures the eighth congress should make from other congresses and other similar gatherings.

There are also many members of the American Chemical Society who are not directly connected with any local section, but who are, nevertheless, in position to make valuable suggestions and to get information for the organizing committee relating to their localities upon request. Such members, by making themselves known to the organizing committee, and setting forth the particular lines along which they are particularly well fitted to obtain information, will thus be making a substantial contribution to the means available to the congress for its proper and complete organization and conduct.

I have endeavored to point out in the foregoing, as specifically as circumstances will now permit, the various and different ways in which the American Chemical Society and its individual members can further the objects of the congress and can cooperate with the organizing committee. It is most desirable that it should be clearly understood and realized by every chemist in the United States that the eighth congress is being organized with the view, among others, towards correct, complete and full representation of every chemical interest in the United States and of the chemical interests of all the geographical divisions of the United States. In order that the congress may be so organized it is needful that its organizing committee be as fully informed as can be, and kept so, and to this end it is the individual chemist acting through the American Chemical Society or one of its sections or divisions, or by direct communication with the organizing committee, who must perform the work. The receipt of every suggestion offered to the organizing committee will be promptly acknowledged and each and every such suggestion will be filed away and taken up for full consideration at the proper time and by the proper committee or officer, and will not be neglected. The fact that the actual holding of the congress is now almost two years off should not deter any one from at once offering his information and suggestion or volunteering his services, whether as a source of information for a certain locality or as any other aid. A postal card notice will be sufficient. The more promptly the organizing committee is fully and completely informed as to what it has to provide and as to the individuals, societies and groups of men upon whom it can count and what each can or will do, the more expeditiously can that committee proceed with its work and the more closely will it approach to the complete realization of the objects and purposes of the congress.

B. C. HESSE

THE PROBLEMS OF THE AMERICAN UNIVERSITY

PRESIDENT SCHURMAN'S annual report for the year closing September 30, 1910, is characterized by a discussion of the pres-

ent problems of higher education, not merely as they affect Cornell University but from the point of view of American universities in general. These problems have to do with the student, the professor, the subjects of the curriculum, and research and productive scholarship. To the consideration of these problems the larger part of the report is devoted. There is, however, an introductory statement on liberal and practical education.

Industrial and technical education has the great merit, not merely of not alienating young men from manual labor, but of keeping them in constant touch and sympathy with it, requiring them to practise the simpler mechanical operations as a part of their curriculum, and training them meanwhile to take up more complex varieties as a life-work after graduation. There can be no manner of doubt that practical and technical education, while giving the individual student an excellent mental discipline, has also stimulated the agricultural and manufacturing industries of the country. And at the same time, by binding together the skilled hand and the educated brain, it has wrought powerfully for the maintenance and diffusion of the spirit of social and political democracy.

The ideal for the college is not difficult to formulate. No student should be permitted to remain in it who does not love the arts and sciences for their own sake and who does not show that love by devoted study, unless indeed he is earnestly pursuing courses with the definite object of preparing himself for some practical work or professional career. To apply the ideal in practise is more difficult because of the number and variety of intermediate cases. Yet no one can deny that in American "colleges" in general, there are far too many students without serious purpose. They are there because their fathers are alumni, or because their mothers recognize the social value of a degree, or because the boys themselves regard "college" as a place for "a good time." Now the colleges of the country were never designed for such persons; and from the point of view of the public interest and American civilization there is no reason whatever why they should be admitted, or, if admitted, suffered to remain. Fortunately Cornell has not a social prestige which attracts this class of students in any considerable numbers and the dean and faculty are inexorable in their insistence on full satisfaction of the requirements for admission and advancement. And this is the one hopeful course to pursue at the present time. Hard work is the solution of most of the college problems which educators are nowadays discussing.

The future of the American university is with the graduate school or department of research. It is by the enlargement of human knowledge that progress in civilization and improvements in the life and condition of mankind are rendered possible. The scientific investigator who discovers new laws of nature does more for the relief, assistance and uplifting of his fellowmen than all the politicians who deafen the world's ears with their panaceas—too often, alas, mere sounding brass and tinkling cymbals. And the infallible lessons of human experience for thousands of years—does not the scholar by patient research spell them out and write them down for our instruction? These two—the scientist with his fruitful experiments, the scholar with his productive research—are the seers and accredited leaders of mankind in this twentieth century. In their light we shall see light, otherwise we walk in darkness. And it is such scientists and scholars who constitute the research department of the university.

This crowning glory of the university is not yet a fact in America; it is only an expectation, or at most a promise. When the realization comes—and come it certainly will, at Cornell or elsewhere—it will mark the final and culminating stage in the development of the university idea. At present the graduate schools of American universities have not been so much departments of research as colleges for the advanced training of prospective teachers and professors.

Here is the multi-millionaire's opportunity for the greatest and best investment in America! By means of a large endowment for research (say $20,000,000, which might be given at once or spread over ten or twelve years) he would make it possible for at least one American university to enter upon the highest stage of university life and activity and to discharge its supreme functions to the American public and human civilization. A university dedicated by such an endowment to advanced work and research would challenge comparison with the best European universities and set an example which would prove contagious among the other leading universities of the United States.

In SCIENCE for August 19 last, there are comparative tables showing the number of doctor's degrees granted by the graduate schools of the universities of the United States for a series of years. It is shown that in the year 1910 Cornell conferred more doctorates in science than any other university in America, and also that the total number of doctorates conferred by Cornell both in the sciences and in the liberal arts ranked third in the list. There is also another very striking and encouraging feature of this tabular exhibit. The number of young investigators earning doctor's degrees at Cornell was twice as great in 1910 as it was on the average for the decade from 1898 to 1907, and furthermore, the increase since 1907 has been steady and uninterrupted.

The fact that there is in American universities a professorial problem itself shows that something is seriously wrong. The university began as a guild of scholars and throughout the seven or eight hundred years of its history the faculty essentially constituted the university. If here and now other elements of the organized university have pushed the faculty from its controlling position, this illustrates, on the one hand, the universal tendency of an organization to suppress the free play of personality and, on the other hand, the human and specially American disposition to entrust the highest interests of mankind—intellectual, moral and spiritual—to a corporate body whose mechanism and operations easily usurp the place of the ends it was designed to subserve.

Whatever organization may be necessary in a modern American university the institution will not permanently succeed unless the faculty as a group of free individual personalities practically control its operations.

Now, if stress is laid on duty and service and not on rights and prerogatives, if the university is conceived not as monarchy or aristocracy or "mobocracy" but as a genuine brotherhood in which the president is merely the first servant of the institution, there would seem to be little difficulty, given a reasonable amount of tact and forbearance, of administering the American university as at present organized to the satisfaction of all parties. One danger indeed lurks in the disposition of some presidents to identify themselves with the board of trustees, to adopt an exclusively administrative attitude, to become merely men of business and men of affairs, and to lose touch with the work and sympathy

with the aims and ideals of the faculty, which, of course, constitute the supreme object of the institution. If, by any kind of reorganization this danger can be averted, the reorganization should be cordially welcomed. A university whose president does not embody and faithfully interpret the spirit of the scholars and scientists who essentially constitute the institution, is to all intents and purposes without a head. It is doubtful, however, whether any kind of organization will save our universities from occasional disasters of this sort. The one remedy is cultivation by the faculty of a sense of responsibility for the welfare and advancement of the institution and a readiness to advise on all matters directly or indirectly connected with the essential functions of the university of which they are the constituted organs and guardians.

But that is not all. In proportion as a university advances to the highest forms of its activity, it leaves behind the sphere of organization and officialdom and is embodied in the personality of its productive scholars and scientists. A Kelvin, or a Pasteur, or a Mommsen represents in his field the whole university; his work is beyond the reach of officers of government and administration; in his library or laboratory, surrounded with the facilities requisite for research, this solitary spirit, unvexed by rules and ordinances, broods creatively over the mysteries of nature and the life of man. The problems of government and administration that harass our universities in their caterpillar stage disappear in the highest phase of their development. At Cornell, for example, a well-endowed graduate school and division of research would know nothing of them.

The number of persons who received instruction in the university in 1909–10 was 5,194, an increase of 335 over the total attendance for the preceding year. And the number of regularly matriculated students, which did not reach 2,000 till the nineteenth century was closing, in 1909–10 not only passed 4,000 but touched 4,227, an increase of 242 in a single year. Although the total attendance of regular students has increased from 2,845 in 1901–02 to 4,227 in 1909–10 the number of women has remained stationary; it was 400 in 1901–02 and 397 in 1909–10.

What is now called a university was originally designated a *studium generale:* a place of study, not merely for students of the locality, but for students from other and all localities. Cornell continues to exhibit in a marked degree this cosmopolitan character of the historic university. It draws about half its students from the state of New York, and the other half from all other states of the union, from North, Central and South America, and from Europe, Asia, Africa and Australia.

The facts and figures given above indicate the student problem so far as numbers are concerned. Cornell University is undertaking to educate several thousands of students every year. And the numbers of students go on increasing in spite of successive advancements made in the requirements for admission and graduation and marked and growing strictness in administering them.

The charter of Cornell University dedicates the institution to research as well as instruction. Might the problem of overcrowding not be solved by turning the university into an institution of research? There are objections in the interest of research itself to this limitation of the institution to investigators with the exclusion of all undergraduates.

Undoubtedly it would be possible to limit the attendance. But what criterion shall be applied for this purpose? The educational standards have already been greatly

advanced, and it is a serious question how much farther in this direction, if any, it is wise to go.

The colleges and universities of the United States address themselves to the average student; and in a democracy there will always be a strong feeling, which is also perfectly natural and just, that higher education should be open to all the boys and girls of the country who are able to pass the requisite examinations. The practise of this theory necessarily tends to make the college and university of the country revolve about the *average* student with a strong pull in the direction of mediocrity. But the student of superior endowments is apt to be sacrificed to the general average. Why might not Cornell University become the peculiar nursery of such promising spirits? A seminary for the aristocracy of talent would be the highest and noblest institution in the world. And no other service to a democracy could compare with this: for to form the mind and character of one man of marked talent, not to say genius, would be worth more to the community which he would serve than the routine training of hundreds of average undergraduates.

A destiny and function of this high character could not be arbitrarily assigned to or artificially imposed upon any university. There could be a happy issue only when the germs of such possibility were already inherent in the organization and operative in its activities. A claim of this sort may be made for Cornell University. If it is still far from the ideal seminary for the aristocracy of talent, the beginnings of that development are visible in the membership of the medical college and the graduate school with their enthusiastic and untiring devotion to independent research and productive scholarship—an intellectual function which none but superior minds can successfully discharge. And, in the second place, while many undergraduates, even though hard-working students, may be intellectually torpid and remain impervious to the force of new ideas, there is a minority, a saving remnant, not only in the course of liberal arts and sciences but also in the courses in agriculture, engineering and other technical subjects who exhibit keen intellectual interest, who become enamored of knowledge, and who develop an ambition to distinguish themselves as scholars or scientists.

A genuine university consists of able professors and students devoting themselves to scholarship and science. If this fact is once recognized the proposal here made will be seen to be at once important and promising. It is, in short, that students shall be selected with as much care as members of the instructing staff, at any rate for the highest division of the university. It will not be practicable, and in all probability it would not be desirable, for Cornell University to exclude the student of average ability if he can pass the prescribed examinations. But let the superior student be regarded as the supreme object, let the men of talent be segregated and instructed by themselves. Of course, all this would involve more endowments and additional teachers. If endowments were forthcoming to foster a qualitative development of this sort at Cornell University the problem of numbers would take care of itself. For this high spirit would gradually take possession of the entire university. The criterion of excellence would be applied to all departments.

The order of relative importance of the sciences in America must be inferred from the attention they receive in the universities. And figures should be given both for the undergraduate and graduate departments. The article in SCIENCE (August 19,

1910) gives the distribution of doctorates conferred in June last by the universities of the United States among the different sciences. There were in chemistry 48, in physics 23, in zoology and physiology 28, in mathematics 23, in psychology 20, in botany—and in geology 10. In 1909–10 there were enrolled of graduate students in Cornell University in chemistry 53, in botany 27, in physics 24, in zoology and physiology 19 and in geology 10. Of undergraduates in Cornell University the number receiving instruction in the different sciences was in 1909–10 as follows: Physics 2,283, chemistry 1,946, geology 1,540, mathematics 952, zoology and physiology 589, botany 438 and psychology 398.

As far as the sciences are concerned, therefore, Cornell University already has a large, well-adjusted and efficient organization by which it strives to vitalize the industries of the country, discipline the minds of the students, and enlarge the boundaries of existing knowledge. The next step is to develop this scientific establishment to the highest potency of which it is capable in this twentieth century. And the means to that end are perfectly simple. Able men, free from sordid cares, enjoying abundant leisure for research, and having ample laboratories and equipment and all the delicate apparatus which modern refined methods of investigation make necessary—such men could erect on the splendid foundations already laid at Cornell University a temple of science unequalled in America and unsurpassed in the world. The demand for scientific investigators, for laboratories, and for instrumentalities of research come to the president from all departments. Some of the professors have thought out plans of development which would necessitate an expenditure of $2,000,000 or $3,000,000 in a single department. And the problem is not for one, but at least for seven fundamental sciences; namely, chemistry, physics, zoology and physiology, botany, geology, mathematics and psychology. The president asks for these departments of Cornell University an endowment of from $1,000,000 to $3,000,000 each, and he will undertake to satisfy any munificent and philanthropic investor with the returns which the scientists will give him on his money.

For the improvement of the condition of the humanistic subjects at Cornell University splendid provision was made by Goldwin Smith, who made the university the residuary legatee of his estate. From this source the university will receive about $700,000. And Goldwin Smith in his will provided that these funds were "to be used by the board of trustees for the promotion especially of liberal studies, languages, ancient and modern, literature, philosophy, history and political science, for which provision has been made in the new hall which bears my name and to the building of which my wife has contributed."

Excluding the funds for the maintenance of the medical college in New York city, the total property of the university, including endowment, real estate, buildings, and equipment, was on August 1, valued at $15,178,174.81. The productive funds included in this total amounted at the same time to $8,687,274.05. The rate of interest received on the investments averaged a trifle over 5 per cent.

The income for the year from all sources amounted to $1,657,331.66. Of this income $281,687.59 was received from the state of New York for the regular maintenance of the state college of agriculture and veterinary medicine, and the receipts from and for the medical college in New York city were $220,269.12. The receipts from stu-

dents (not including the students of the medical college in New York city) were $339,769.49 for tuition fees, $59,936.19 for laboratory fees, and $41,187.06 for incidental fees. There was received from the United States under the second Morrill Act $25,000, under the Nelson Act $15,000, under the Hatch Act $13,500, and under the Adams Act $8,775. The income from invested funds amounted to $440,546.52.

The expenditures of the university exceeded the income for the year by $33,375.79. These expenditures included as an extraordinary item $34,643.80 to extinguish the debt on Goldwin Smith Hall.

Cornell University is supported by its old students and alumni, by the state of New York and the United States, and by rich men and women who recognize the value and importance of its work. For the millions of dollars it now needs the university must look to the generosity of this latter class—the millionaires who are seeking the highest and best investments for their surplus funds.

The United States is an industrial democracy, and the civilization of the United States must develop on that foundation. Cornell University stands both for the industrialism of America and the idealism of Athens. Its technical courses represent the one, its liberal arts the other. Human civilization in an industrial democracy must embrace both. This comprehensive curriculum, which starts with the industries of the people and soars to the laws of nature and the historic life of mankind, is enormously expensive to maintain. That is to say, the number of teachers must be exceedingly large to cover so varied a field of subjects. And so it happens that besides endowments for research, the supreme need of the university is of endowments for a large number of professorships, especially in science and in the technical branches, affording stipends sufficient to attract the ablest men and to dignify the teaching profession.

A third great need of the university is the superior student, the youth of talents and ability decidedly above the average. It is this saving remnant of students of distinction who make the higher work of the university well worth while. It is the highest function of a university to catch these youths whom nature herself has ordained to art, literature, philosophy, science or invention, and train them for the work they are specially fitted to do. Society, too, is profoundly concerned for their intellectual nurture; for on them the progress of civilization depends. Why is it we are always complaining of the dearth of talent in politics, in literature, in the professions? Is it not because we do not draw from a sufficiently large area? Education and natural talent are not always made to meet. The precious seed is allowed to be wasted.

Lastly, says President Schurman, the local habitations and the physical appliances of these intellectual workers, investigators, teachers, students, are sadly inadequate. And the report concludes with an appeal for half a dozen new scientific laboratories, a gymnasium, an auditorium and one or two other buildings for general university purposes, and a score of residential halls for the thousands of young men for whom the university has not to-day a single dormitory.

THE RELATION BETWEEN COLLEGE STUDIES AND SUCCESS IN LIFE

THIS year, for the first time in more than a quarter of a century, the entering class at Harvard College finds its choice of studies restricted by a constructive modification of the elective system. This is the